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Nevada Urban Equine Project

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ABSTRACT

In 1998 and 1999 the National Agricultural Statistics Service produced estimates for equine using a variety of survey instruments. The Nevada State Statistical Office (SSO) felt that the survey indications grossly understated the equine population in Nevada. Several factors are thought to have contributed to the perceived undercount of the Nevada equine population. Two of the most prevalent reasons were an insufficient number of samples from the area frame and the allocation of most samples to non-urban areas (the area sample targets more traditional agricultural commodities). This problem, while not unique to Nevada, was particularly acute in Nevada due to the high degree of urbanization in the State and the extreme popularity of equine within the urbanized, non-farm population. This paper details the steps used to design an area based sampling frame using zoning maps obtained from local municipalities to produce estimates of equine in the urban areas around Las Vegas and Reno, the procedures used to collect the data, and the results of the pilot survey that was conducted.

KEY WORDS

Area frame; Equine; Urban; Zoning maps.

This report was prepared for limited distribution to the research community outside the U.S. Department of Agriculture. The views expressed herein are not necessarily those of NASS or USDA.

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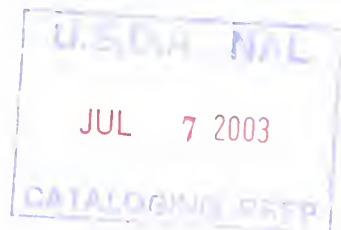


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SUMMARY

The Nevada State Statistical Office (SSO) believed that the multiple frame estimates for equine produced by NASS in 1998 and 1999 were under-representing the equine population in Nevada. They believed that the estimates did not reflect the actual total number of equine located in the State because the surveys used to produce the equine estimates were based on samples mainly from traditional agricultural areas and that these surveys did not sample heavily enough from urban areas.

They contacted the Area Frame Section to discuss the possibility of using zoning maps obtained from local municipalities to use for sampling to produce estimates for the urban areas around Las Vegas and Reno. This paper details the steps the Area Frame Section took to design an area based sampling frame for the project, the procedures used by the Nevada SSO to collect the data, and the results of the pilot survey that was conducted.

Zoning maps resulted in 479 sections of land (blocks of approximately 640 acres) with some land in the section being zoned for equine. The sampling unit was set at 1/4 of a section to allow for ease in data collection. The population was broken into four different strata based on location and percent of the section zoned for agriculture. Sample sizes were set at 15 in each of the two northern Nevada strata and 20 in each of the two Las Vegas strata, for a total sample size of 70 segments. Sample size was confined by resources available for data collection.

Materials were sent to the Nevada SSO in January of 2000. Data collection was completed in May of 2000. The results of the survey indicated that there were $17,129 \pm 3,554$ horses in the areas covered by this survey, i.e. the equine frame. There were $4,224 \pm 873$ places with horses. Very few other equine (mules, donkeys or burros) were found in the survey. The total number of equine should be treated as a minimum estimate since the equine frame did not cover the entire State. The results of this pilot project showed that there are more equine located in urban areas in Nevada than were being found using traditional NASS surveys. By contrast, there were 1,527 farms with 14,220 horses found in Nevada during the 1997 Census of Agriculture. Based on the 1999 Equine Survey which counted all equine (including mules, burros, donkeys and other equine) there were 16,420 head (on and off-farm) in Nevada, although the 25 percent coefficient of variation for this indication was quite high. The official estimate was 70,000 head.

BACKGROUND

In 1998, U.S. equine estimates were based on the 1997 Census of Agriculture and two additional surveys. The 1997 Census of Agriculture, adjusted for coverage, was utilized to provide an on-farm estimate of equine inventory and sales. A U.S. level area frame sample of 16,000 randomly selected segments of land, measuring approximately one square mile was screened to locate places with equine. These places were asked to report inventory and sales information. This sample produced an indication of total equine inventory and a measure of completeness of the coverage of the 1997 Census of Agriculture and of commercial operations. A list survey of known larger commercial operations was also conducted. Operations found in the area frame sample were compared to names from the list of commercial operations to remove duplication. The U.S. sample from the list of commercial equine operators included approximately 20,000 places. Information collected during the area frame and commercial list surveys was used to determine if sampled places were represented in the Census of Agriculture. Data from the two surveys were combined with the Census of Agriculture to provide a complete picture of the U.S. equine inventory and sales.

The 1999 U.S. equine estimates made use of the 1997 Census of Agriculture and two additional surveys. As in 1998, a U.S. area frame sample of approximately 16,000 segments of land was used to collect equine data. A survey of 20,000 larger farm and commercial operations was also conducted. Estimates were calculated using data from the two surveys. Survey procedures ensured

that all equine places, regardless of size had an opportunity to be included. The samples resulted in over 37,000 places contacted nationwide for the January 1999 inventory estimate. Useable positive data were obtained from over 30,000 reports. Administrative data available from auction houses, slaughter data, and other published equine surveys were used during the estimation process. The relative sampling error for the U.S. inventory was 2.7 percent.

However, based on personal knowledge and associations with equine industry groups, the staff of the Nevada SSO disputed the indications from the 1998 and 1999 equine surveys. It was the consensus of the group that the survey indications grossly understated the Nevada equine population. Several factors are thought to have contributed to the perceived failure of the NASS triple frame estimator to adequately measure the Nevada equine population, but the two most prevalent were an insufficient number of area samples (only 26 segments) and the allocation of most area samples to non-urban areas.

The problem, while not unique to Nevada, was particularly acute there due to the high degree of urbanization in the State and the extreme popularity of equine within the urbanized, non-farm population. Nevada is one of the most urbanized States in the Nation with approximately 90 percent of the population residing in areas considered urban. The Las Vegas area alone accounts for two-thirds of the total Nevada population. Nationally, 75.2 percent of the United States population was considered urban in the 1990 Population Census, and fourteen States were less than 60 percent urbanized.

Nevada is a “western” State and the ways of the Old West are idolized. Nevada hosts the National Finals Rodeo, the Reno Rodeo and many, many more. High school rodeo is very popular. Roping clubs, 4-H equine clubs, team penning clubs, breed associations, etc. are all very popular. The Reno Livestock Events Center hosts major equine events virtually every week. These factors contribute to an industry climate where most of the equine are owned by non-farm entities and kept for sport and pleasure.

The Nevada State Statistical Office (SSO) approached the Area Frame Section (AFS) looking for an alternative or supplementary area frame that would efficiently and accurately measure the equine population in the urban and ag-urban areas of the State.

NASS currently uses an area frame to measure incompleteness in its list of farm operations. An area frame for a State is constructed by classifying all land in a State into “strata” based on use. In Nevada, nine land categories or strata were used: 2 strata identified agricultural lands, 2 strata identified urban areas, 4 strata identified different types of range lands, and 1 stratum was used for non-agricultural land. These strata are further subdivided into primary sampling units or PSUs for efficiency in sampling. The PSU consists of six to eight segments of land, each approximately one square mile in area. A segment is the final sampling unit in the traditional area frame survey.

To identify urban areas where equine were permitted, the Nevada SSO obtained county and city zoning maps for areas around Las Vegas, Reno, Carson City, and Douglas County. It was thought that these zoning

maps could be used in conjunction with the current area frame in Nevada to conduct this survey.

FRAME CONSTRUCTION

Only two approaches were considered given the materials available and the time available in which to design and conduct the survey. This survey was designed, materials assembled and data summarized by AFS staff with the help of a summer student intern. The Nevada SSO performed all data collection and editing aspects of the survey with no extra staff allocation.

The initial approach investigated by the AFS was to compare the zoning maps to the current area frame stratification to see how well, if at all, the Primary Sampling Units (PSUs) used in the 1987 area frame matched up with the zoning maps. This approach would allow for integration with current area frame procedures and allow the data collected in this pilot survey to be combined with data from previous and future Area Frame surveys in a statistically defensible manner.

The second approach investigated by the AFS was to use the data on the zoning maps in conjunction with range, township and section boundaries to create a separate area based frame for equine. Since much of the zoning and development in Nevada appears to follow the township lines, using those lines as the basis of the survey frame could make the sampling units match up better with the actual zoning for equine and make the units easier to delineate and find in the field during data collection. This approach would allow for full utilization of the

current zoning maps (i.e., exclude areas not of interest) and give more flexibility to making changes to the new equine frame based on what was learned during the initial surveys.

Both approaches had advantages that would be highly desirable. To aid in the final decision, more information was needed on the correlation between the current PSUs and the location of areas zoned for equine.

Choosing a Primary Sampling Unit:

The Nevada SSO obtained multiple zoning maps (listed in Appendix 1) which covered the areas around Las Vegas, Reno, Sparks, Carson City and Douglas County. These maps were of different scales and from different government entities. They were also not contiguous. In some cases the whole township was zoned for horses; on other zoning maps only a portion of a section was zoned for horses.

It was necessary to merge the information contained on the different zoning maps to see if there was overlap. This would also facilitate a comparison with the maps containing the PSUs from the traditional area frame. Acetate was placed over the traditional framework maps from the area frame (which are constructed on 1:100,000 USGS maps), then the boundaries from the different zoning maps were transferred to the acetate by shading in the areas zoned for equine.

This was done by the AFS for the Reno/Sparks area and for the Las Vegas area because these were the first of many zoning maps received from the Nevada SSO.

Before this mapping was finished, it was apparent that the areas zoned for equine did not line up with the PSU boundaries. This problem was accentuated because the PSUs in Nevada around many urban areas were large due to most of this area being in a range stratum in the traditional area frame. This meant that the area for sampling would include land that was not zoned for equine and was not intended to be in this project. With these extra, non-targeted areas in our sample, the likelihood of selecting segments that were zoned for equine would decrease. Thus, it was decided to base the sampling unit on the range/township/section lines and not the PSUs from the traditional NASS area frame.

A regular range/township is a six-mile square containing 36 square miles. Each square mile is called a section. The primary sampling unit for this equine project would be a section within a range/township.

Determining the Population:

Once the primary sampling unit was chosen, the next step was to determine exactly which sections would be included in the population (based on the data in the zoning maps) and then determine how much of the section was zoned for equine. The zoning maps exhibited a wide range in the percent of each section zoned for equine. Because each section was not always 100 percent zoned for equine, the decision was made to classify each section based on the percent of that section zoned for equine. It was also anticipated at this time that it might be desirable to stratify the sample based on the percent of the section zoned for equine to control where the samples were distributed.

Determining the percent of each section zoned for equine required many hours. This task was complicated by the fact that many of the maps had different scales and, frequently, the range/township lines on the maps were not clearly delineated. Therefore, to facilitate the process, several grids were created out of acetate to approximate the size of the township squares on each map. The grids were subdivided into 49 sub-squares by drawing a 7x7 grid on them. By placing one of these grids over its corresponding zoning map, the percent of the area zoned for equine could be calculated by counting the sub-squares which fell in the zoned areas. Each sub-square represented approximately 2 percent of the area in the section. Although this was an approximation, it was felt to be close enough considering the constraints on the project. Also, there was no guarantee that there would be a high correlation between the percent an area was zoned for equine and the actual presence of equine. Although the technique may have lacked some accuracy, it did have precision--or consistency between the measurements taken--which is perhaps more important for stratification purposes. The ideal method would have been to determine the acreage in each section by digitizing the area zoned for equine in each section, but due to timing and staffing limitations this approach was not used.

Using the grid, the exact range and township of each section that was zoned for equine was determined as well as which individual sections were zoned for equine. The percentage of each section that was zoned for equine was then computed. A list of all of the information (map, range, township, section, percent zoned for equine) was

created. A second person checked the work and corrections were made as needed.

A spreadsheet was created and sorted by range/township/section to detect any duplication between zoning maps. This occurred because there was some overlap between the range/township/sections on the different maps. For example Range 19E, Township 18N, Section 25 was on both the SW Truckee map and the Forest map and was zoned for equine on both. The total percent zoned for equine was computed whenever this occurred. These 'duplicate' sections were marked as such in the spreadsheet. A list was also used to keep track of sections that were not approximately 640 acres in size or sections that were only partially included on the zoning map. This was done so that expansion factors could be properly adjusted before computing the final estimates.

Analyzing the Sections:

In an attempt to get a better understanding of the characteristics of the sampling units (sections), several analyses were performed on the data. The mean and median for the data were computed at various levels: the entire population; the population divided into sub groups such as Las Vegas, Douglas County, Northern Nevada; and for each individual map. Using the same divisions, bar graphs were created showing the percent of each section zoned for horses. These graphs gave a sense of the distribution of data: whether most sections were predominately zoned for equine, whether the sections tended to only have a tiny part with that zoning, etc. (See Appendix 2 for some examples of these graphs). The graphs also gave us a cursory idea of stratum breaks. To

find more accurate breaks, a SAS program was written based on statistical methods recommended by Cochran (page 128) to determine the appropriate stratum breaks dependent upon the number of strata desired.

The graphs were also used to decide a minimum cutoff below which sampling would not occur. Originally the plan was not to include any section with 2 percent or less of its area zoned for equine. This decision was made partially due to the precision in the method used to measure the zoning percentage and also due to the small chance of finding equine in these kind of sections.

The final decision was to exclude sections in which less than 10 percent of the land was zoned for equine. Although eliminating members of the population reduces the statistical validity of the survey, it was felt that because this was a pilot survey it was crucial to keep the sample size low enough so that the survey was affordable while at the same time keeping our methods statistically defensible. Since there were no prior data on what correlation there might be between the percent of a section zoned for equine and the actual presence of equine in the section this approach seemed to be a conservative one. Overall, 134 sections were eliminated. This cutoff may need to be changed for future surveys, particularly if the sampling unit is changed to a smaller unit.

Input from the State Statistical Office:

In addition to providing the AFS with the zoning maps used, the Nevada SSO provided additional help throughout the process. On numerous occasions they were

consulted to make sure that they agreed with the method that was being proposed and to see if they had any insight on the equine population which would help in the construction of this new equine frame. They supported the decisions to use section lines and to stratify the sample. They knew that by Nevada zoning laws, there had to be at least one acre of property to have equine. They told us that, in general, most people keep more than one horse. The SSO had done some limited research earlier that showed an average number of equine per place at 4.7 head. This information was essential in the final determination of the size of the sampling unit to be enumerated. The SSO also determined the budget for the survey, which in turn affected many of the decisions about the survey, such as the size of a segments and the overall sample size.

The Segment:

After discussions with the Nevada SSO, the decision was made not to enumerate an entire section due to the large number of contacts this would entail and the length of time it would take to enumerate. We set the segment size at just 1/4 of a selected section. So within a range/township, a section was selected for sampling. Then one of the four quarter sections was randomly chosen. This resulted in a segment size of approximately 160 acres.

SAMPLING METHOD

The Nevada SSO suggested splitting the sample into two strata (northern Nevada and the Las Vegas area) to control the number of segments selected in each area. The population was further stratified by the percent of the section zoned for equine. This resulted in four strata, as described below. Sample size was set using a multi-variate optimal allocation modified to fit the time and resources available. The final sample sizes and population counts are also listed in Table 1.

The actual sampling was accomplished, within stratum, by sorting the data by range/township and then by section and taking a systematic sample within each strata.

DATA COLLECTION

Materials:

The AFS sent the Nevada SSO several options for materials to use for enumeration. The standard for a traditional NASS area frame survey is a 24x24 inch photo with a scale of 8 inches per mile (and a cost of \$16 per photo) and a map to show the overall location of the segment within a county. The options for this pilot survey included the 24x24 inch photo, as well as the use of contact prints (scale of 1: 43,000 and cost of \$5 each), 200 to 300 percent enlargements of the contact prints (\$5-\$7 per segment), 1:100,000 scale BLM maps and 7.5 minute USGS quad maps. The zoning maps were also available.

Table 1. Strata Definitions and Sampling Information

| Strata | Definition | Number of Sections in the Population | Sample Size |
|---|---|--------------------------------------|-------------|
| 1 | Northern Nevada - Sections with equine zoning between 10 and 49% | 186 | 15 |
| 2 | Northern Nevada - Sections with equine zoning between 50 and 100% | 94 | 15 |
| 3 | Las Vegas Area - Sections with equine zoning between 10 and 49% | 79 | 20 |
| 4 | Las Vegas Area - Sections with equine zoning between 50 and 100% | 120 | 20 |
| Total Sample Size for Nevada Equine Project | | 479 | 70 |

The final decision was to use enlargements of a contact print. The cost of a larger photo was too prohibitive. Also the photo would be used merely as a location aid and not to record data about the segment, as is done in the traditional NASS area frame survey. An exact scale or acreage within each segment was not required. A photo copy of a USGS 7.5 minute quad would also be included to aid in location, as would a photocopy of the appropriate area on the zoning map.

A note about the photography and also on the contact prints is needed: the date of the only available photography was from 1994 and 1995. It is highly likely that there has been considerable change in land use in the urban areas that were of interest for this survey since 1994/95. Nevada has been the fastest growing State in the Nation for the past several years with most of that growth concentrated in the urban areas under study. Dated photography was therefore a concern in some segments. The decision to use photography in the future will need to be reexamined in light of its usefulness during data collection.

Once this decision was made, contact prints for the selection sections were ordered. Fifty-two different contact prints were ordered from the USDA/FAS/APFO lab in Utah at a total cost of \$260. Ten USGS 7.5 minute quad maps were purchased at a cost of \$40. Once the contact prints were received the enlargements would be made on a day-light camera at a cost of approximately \$100. (This camera is no longer available for use - the AFS is now relying on digital photography to replace the day-light camera).

Using the contact prints, each section was located and marked in yellow. As many as

three segments were drawn on a contact when appropriate. A quarter section was randomly selected for each segment and outlined and labeled with the segment number in red. Enlargements were then made. Meanwhile photocopies of the appropriate sections were made from the zoning maps and the selected quarter section highlighted and labeled with the segment number. Copies were also made of a USGS map with the segment highlighted and labeled. A set of master maps were also constructed showing the location of the all the segments in the sample.

Data Collection:

Materials were sent to the Nevada SSO at the beginning of January 2000. Data collection began on the 15th of January and continued until completion on May 18th. Don Gephart and Marty Owens collected most of the data. Data were collected from the equine operators themselves when possible, and also from observation and information from neighbors. No estimates for incompleteness, other than observation, were made during data collection.

In the southern portion of the State around Las Vegas, segment boundaries were for the most part very visible because roads followed the section lines. The maps supplied by the AFS were supplemented with current road maps from MSN City Search. A vehicle odometer was used to determine the boundaries of the segment along with the use of the maps for starting points. Identifying the selected primary sampling unit for this project was not a difficult process in the south. Problems did occur when areas that contained horses were found and no residents were available. The

construction of concrete block walls from 5 to 8 feet tall made it nearly impossible to determine if horses were on a location or not. All efforts were made to determine equine presence including identifying horse trailers, barns, or horse residue. Neighbors were asked about equine presence in the neighborhood and were very helpful. In some instances being able to peer through gates became the mode of collecting data. There is a good chance that not all the horses were accounted for, because only visible horses were counted.

The northern portion of the State presented a different situation. Not all the roads followed section lines so reliance on the maps and photos became very important. Again, the reliance on neighbors became important in collecting the data. However, the solid block walls were not as prevalent as they were in the southern portion of the State. In some areas no attempt was made to contact each individual operation because of time and money constraints. Observation was used for many samples. Some segments had as many as 22 places with visible equine activity, and again, only equine that were visible from the road were counted.

Another situation that arose was when a field with horses crossed over the segment boundary. When that occurred, an estimate was made as to what portion of the entire field was within the segment and the equine were distributed using that ratio. A complete search of the segment had to be made to account for all horses in the segment. Several horses were found behind hills and in other places where tracks and other physical markings were obscure.

In both areas, some of the segments were

adjacent to places with large numbers of horses. Some of these locations were large horse training operations and some were boarding stable operations, while others were a combination of both. With these types of operations, the density of horses was very high. While some of these operations were in the sample, perhaps a list based sample might improve the accuracy of the survey.

The Nevada SSO spent seven staff-days collecting data in the Reno area and seven staff-days collecting data in the Las Vegas area.

DATA SUMMARIZATION AND ESTIMATES

The final data files were sent from the Nevada SSO to the AFS on May 10, 2000. Data were summarized using SAS. Estimates of the number of equine and number of equine places in the areas covered by the survey were calculated along with appropriate measures of variance.

The results of the survey showed there were 17,129 horses \pm 3,554 horses. There were 4,224 places with horses \pm 873 places with horses in the areas covered by the survey. Tables 2 and 3 have the results, by strata, for horses.

By contrast, there were 1,527 farms with 14,220 horses found in Nevada during the 1997 Census of Agriculture. Based on the 1999 Equine Survey which counted all equine (including mules, burros, donkeys and other equine) there were 16,420 head (on and off-farm) in Nevada. This indication had a coefficient of variation of 25 percent. The official estimate was 70,000 head.

The results from this pilot survey for other equine was 124 head \pm 101 head; however, there were only two positive reports for other equine. The total number of places with other equine was 75 places. The results by strata for other equine are not included in Tables 2 or 3 below.

Analysis was also done to see where equine were found in the sample. For example, we

looked for a correlation between the actual number of equine found and the strata the segment was in (i.e., did areas with over 50% of the land zoned for equine actually have more equine in them?). This type of information could be helpful in determining sample sizes, stratification schemes and sample distributions for any future surveys.

Table 2: Survey Results for Total Horses

| Strata | Number of Quarter Sections | Sample Size | Expansion Factor | Number of Segments with Horses | Raw Total Horses | Expanded Total Horses | C.V. |
|--------|----------------------------|-------------|------------------|--------------------------------|------------------|-----------------------|------|
| 1 | 744 | 15 | 49.6 | 7 | 69 | 3,422.4 | 32.7 |
| 2 | 376 | 15 | 25.1 | 7 | 227 | 5,690.1 | 35.2 |
| 3 | 316 | 20 | 15.8 | 6 | 76 | 1,200.8 | 70.4 |
| 4 | 480 | 20 | 24.0 | 10 | 284 | 6,816.0 | 37.8 |
| Total | 1,916 | 70 | | 30 | 656 | 17,129.3 | 20.7 |

Table 3: Number of Places with Horses

| Strata | Number of Places with Horses | Mean Number of Horses per Place | Median Number of Horses per Place | Expanded Number of Places |
|--------|------------------------------|---------------------------------|-----------------------------------|---------------------------|
| 1 | 15 | 4.6 | 3 | 744.0 |
| 2 | 70 | 3.2 | 2 | 1,754.7 |
| 3 | 15 | 5.1 | 2 | 237.0 |
| 4 | 62 | 4.6 | 3 or 4 | 1,488.0 |
| Total | 162 | 4.0 | 3 | 4,223.7 |

The sample resulted in only 43 percent of the selected segments having horses in them. This ranged from a low of 30 percent in the “low zoned” areas of Las Vegas to a high of 50 percent in the “high zoned” area of Las Vegas. There was not a significantly higher number of equine or equine places in the strata zoned more highly for equine. This can partially be explained by the fact that the percent zoned was attached to the whole section and not the quarter section and by the fact that everyone living in an area zoned for equine does not have to have equine. Table 4 shows that most of the total horse estimate, however, was from the two strata “highly” zoned for equine. Together the two “high zoned” strata accounted for 78 percent of the number of horses in the sample and 73 percent of the expanded number of horses.

The data also shows that there were 40 segments (57 percent) that had no equine in

them at all, even though the sections they were in were zoned for equine. This breaks down to 16 of the 30 segments from Northern Nevada and 24 of the 40 segments in the Las Vegas area (53 percent and 60 percent respectively). So the correlation between being zoned for horses and having horses was not as high as hoped.

The initial sampling was done at the section level but the actual sampling unit was a quarter section. The selected quarter sections were reexamined to determine the actual percent zoned for equine for just the selected quarter section. This was done to determine whether the quarter section should be used as the sampling unit instead of the section for any further projects. The information about quarter sections is presented in Table 5 and discussed later in this section.

Table 4: Percent of Segments with Horses and Percent of Estimates, by Strata

| Strata | Sample Size | Number of Segments with Horses | Percent of Segments with Horses | Number of Total Horses | Percent of Total Raw Number of Horses | Expanded Total Horses | Percent of Total Expanded Number of Horses |
|--------|-------------|--------------------------------|---------------------------------|------------------------|---------------------------------------|-----------------------|--|
| 1 | 15 | 7 | 47 | 69 | 10 | 3,422 | 20 |
| 2 | 15 | 7 | 47 | 227 | 35 | 5,690 | 33 |
| 3 | 20 | 6 | 30 | 76 | 12 | 1,201. | 7 |
| 4 | 20 | 10 | 50 | 284 | 43 | 6,816 | 40 |
| Total | 70 | 30 | 43 | 656 | 100 | 17,129 | 100 |

Table 5: Number of 1/4 Sections by Percent Zoned Equine, Total Number of Unexpanded Horses and Places.

| Zoning for Selected Quarter Section | | Segments with Horses | | | | | | | | Segments with No Horses | | | | | | | | T o t a l | | |
|---|---|----------------------|----------------|--------------------|-----------------|-------------------|-------------|--------------------|----------------|-------------------------|--------------------|-------------|--------------------|----------------|-------------------|------------------|--------------------|-----------------------|--------------|--|
| | | Northern Nevada | | | | Las Vegas | | | | Sub Total | Northern Nevada | | | | Las Vegas | | | | Sub Total | |
| | | Str 1 (10-50%) | | Str 2 (50-100%) | | Str 3 (10-50%) | | Str 4 (50-100%) | | | Str 1 (10-50%) | | Str 2 (50-100%) | | Str 3 (10-50%) | | Str 4 (50-100%) | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 0% | Number 1/4 Sections Unexpanded Horses Unexpanded Places | 3 31 6 | - | - | 1 9 1 | - | - | - | - | 4 40 7 | 3 | - | 5 | - | 8 | 12 40 | | | | |
| < 10% | Number 1/4 Sections Unexpanded Horses Unexpanded Places | - | - | - | - | - | - | - | - | - | - | - | 2 | - | 2 | 2 | | | | |
| 10 - 50% | Number 1/4 Sections Unexpanded Horses Unexpanded Places | 2 14 7 | 1 24 2 | 4 12 5 | - | 7 50 14 | 1 | 2 | 4 | - | 7 | 1 | 2 | 4 | 7 | 14 50 | | | | |
| 50 - 100% | Number 1/4 Sections Unexpanded Horses Unexpanded Places | 2 24 2 | 4 128 34 | 1 55 9 | 2 12 6 | 9 219 51 | 2 | 4 | 3 | 2 | 9 | 2 | 3 | 3 | 10 | 19 219 | | | | |
| 100% | Number 1/4 Sections Unexpanded Horses Unexpanded Places | - | 2 75 34 | - | 8 272 56 | 10 347 90 | 2 | 3 | - | 8 | 10 | 2 | 3 | - | 13 | 23 347 | | | | |
| | Total Segments Total Horses Total Places | 7 69 15 | 7 227 70 | 6 76 15 | 10 284 62 | 30 656 162 | 8 8 8 | 8 8 8 | 14 14 14 | 10 10 10 | 40 | 8 8 8 | 8 8 8 | 10 10 10 | 40 | 70 656 162 | | | | |

It seems logical that removing a level in the stratification process, by stratifying at the quarter section level as opposed to the section level, would be more efficient; i.e., there would be fewer segments with no equine. This however, would only be true if there were positive correlation between zoning and the actual presence of horses (this correlation was not as high as hoped). To make this determination the re-zoned quarter section data would have to be examined.

There were 14 segments that when reexamined at the quarter section level, were zoned at less than 10 percent equine. These segments would not have been in the sample if the survey were originally sampled at the quarter section level instead of at the section level. Equine, however, were actually found in four of these segments.

Overall, there were 40 segments or quarter sections that had no equine reported in them. Ten of these segments were zoned less than 10 percent for equine. Of the 30 remaining segments without equine: 22 were in 'low zoned' strata and 18 in 'high zoned' strata and contained no equine.

Of the remaining 30 segments that did have equine, 22 of the segments were actually in the appropriate strata (i.e., the same strata as the whole section), one quarter section was zoned 'high' when it actually was 'low', two quarter sections were zoned 'low' when they should have been zoned 'high' and four segments that were not zoned for equine actually **had** equine.

On the whole, given this small sample size, it does not appear that stratifying on quarter sections would change strata definitions for all that many segments. It does appear that we could eliminate a number of quarter sections

from the population because they are not zoned for equine. However, we did find data in some of these segments, so eliminating them from the sample by changing the stratification level from a section to a quarter section may not have the desired effect. Also the small sample did not provide enough data to fully evaluate the 10 percent cut off.

CONCLUSIONS

The Nevada Urban Equine Project clearly demonstrated that there were more equine in Nevada than previous surveys indicated. This is due to the nature of equine production in Nevada and to the high emphasis placed in NASS surveys on sampling in agricultural areas with less emphasis on sampling in urban, suburban or rural-urban areas. The small samples sizes in Nevada add to this problem.

The project gives the Nevada SSO a new base to work from when setting equine estimates in the future and certainly presents other options to use if equine estimates are to be produced in the future.

If this project were to be repeated the following changes to the original project are recommended:

RECOMMENDATIONS

- 1) Re-stratify the frame at the quarter section level for the Las Vegas area.
- 2) Explore a way to break down sections into smaller units for the Northern Nevada areas that would make data collection in that area easier. Quarter sections could continue to be used or sections could be broken into quarters of sections not using quarter section lines but using streets or other permanent boundaries when streets are not available. This would make the actual breakdown of the segments

more difficult because the four smaller units would need to be approximately the same size.

3) Consider another stratum (or two) so that areas within the zoning maps not zoned for equine, and/or zoned at a very small percentage, could be sampled very lightly.

4) Acquire new photography for the selected segments. Hopefully, APFO would have newer coverage of Nevada available (photography later than 1994/1995).

5) Correct any errors found in the frame over the course of doing this project. There were areas zoned RU (rural open land) that were mistakenly excluded on two of the zoning maps for the Las Vegas area. The maps were map 140 and map 175. This would add approximately 40 sections to the frame all zoned at more than 50 percent for equine.

6) Set up a summary system such that the Nevada SSO could process the data collected themselves.

7) Stay aware of the changes in zoning regulations for these areas. If large areas have been added or deleted changes could be incorporated into the frame and re-stratification done.

8) Expand the scope of the project to other urban areas in Nevada.

9) If the Nevada area frame were to be updated by the AFS, consideration should be given to identifying these urban/high equine areas.

REFERENCES

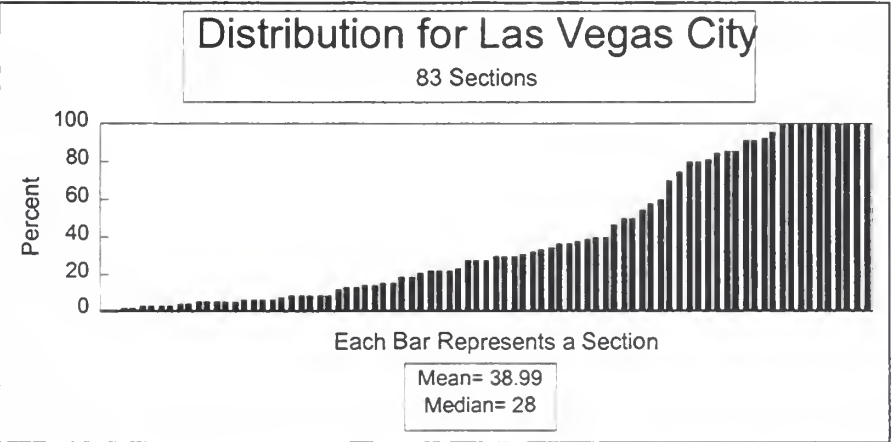
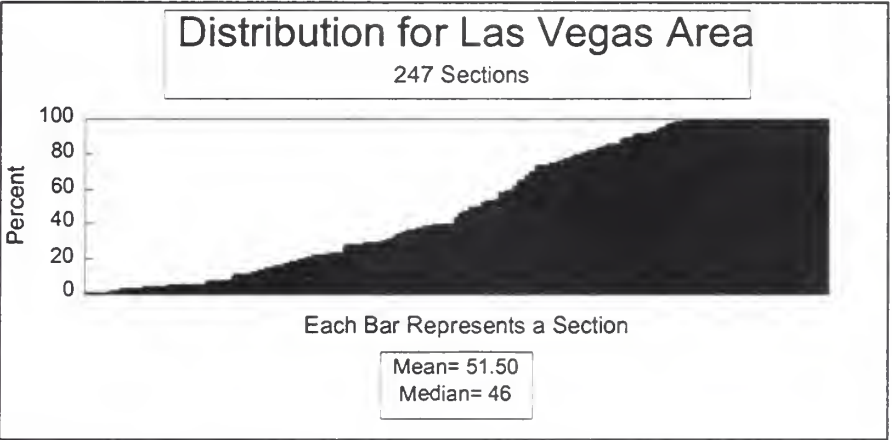
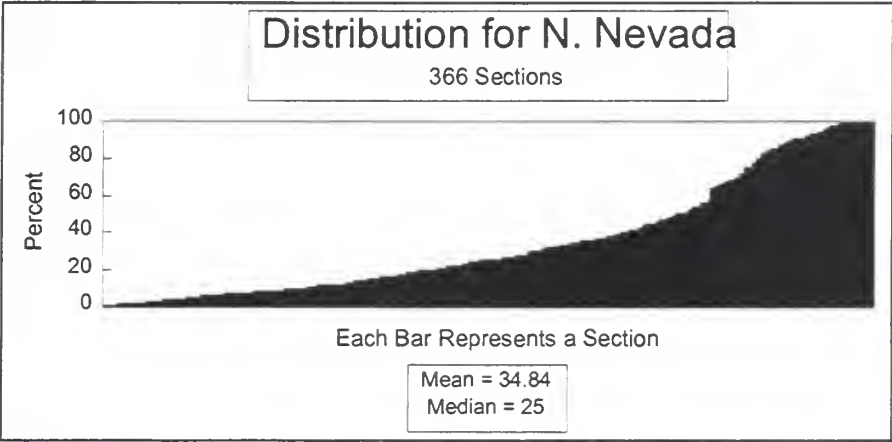
Cochran, W. G. (1977), Sampling Techniques, Third Edition, John Wiley & Sons, New York.

APPENDIX 1: ZONING MAPS USED

| Northern Nevada (Washoe & Douglas Counties) | |
|--|--|
| Map Name | Number of Sections with Zoning for Equine |
| 4500 scale - Douglas Co | 68 |
| 4000 scale - Douglas Co | 24 |
| | |
| Carson City | 39 |
| Sparks City | 8 |
| Reno City | 37 |
| | |
| Forest | 8 |
| Northern Valley | 70 |
| South Valley | 40 |
| SW Truckee | 36 |
| SE Truckee | 11 |
| Spanish Spring | 7 |
| Sun Valley | 4 |
| Verdi | 14 |
| TOTAL | 366 |

| Las Vegas Area (Clark County) | |
|--|--|
| Map Name | Number of Sections with Zoning for Equine |
| Las Vegas City | 83 |
| | |
| Las Vegas - 125 | 8 |
| Las Vegas - 140 | 26 |
| Las Vegas - 161 | 28 |
| Las Vegas - 163 | 28 |
| Las Vegas - 175 | 5 |
| Las Vegas - 176 | 36 |
| Las Vegas - 177 | 33 |
| TOTAL | 247 |

APPENDIX 2: EXAMPLES OF GRAPHS OF DISTRIBUTIONS OF AREAS ZONED FOR EQUINE



APPENDIX 3: EQUINE SURVEY QUESTIONNAIRE

NASS NATIONAL
AGRICULTURAL
STATISTICS
SERVICE
U.S. Department of Agriculture
Rm 5805, South Building
1400 Independence Avenue, S.W.
Washington, D.C. 20250-2000
202-720-7017

EQUINE SURVEY JANUARY 1999

Form Approved
O.M.B. Number 0535-0227
Approval Expires 12/31/01
Project Code 115
QID 110100

Dear Equine Owner:

The following data on horses, ponies, mules, donkeys or burros are needed to prepare **estimates** of equine inventory and sales which will be published in March 1999. Response to this survey is **voluntary** and not required by law, but your response is important to ensure reliable estimates. Individual reports are kept **confidential**. Please complete and return this report promptly in the enclosed envelope, which requires no stamp.

Sincerely,

Rich Allen
Rich Allen, Chairperson
Agricultural Statistics Board

Please make corrections to name, address and Zip Code, if necessary.

1. On **January 1, 1999**, were there any equine (**horses, ponies, mules, donkeys or burros**), regardless of ownership, on this operation?

☐ **YES** - Continue with **Item 2**.

☐ **NO** - At any time during 1998, were any equine sold by this operation?

☐ **YES** - Go to **Item 4**.

☐ **NO** - Enter **Code 3** and go to **Item 7**.

206

2. How many equine **regardless of ownership**, were on this operation on **January 1, 1999**? Number

3. How many of the (Item 2) equine did **this operation** own on **January 1, 1999**? Number

4. How many equine **owned** by this operation were **sold** during **1998**? Number

**HORSES AND
PONIES**

**MULES, DONKEYS
OR BURROS**

| | |
|-----|-----|
| 209 | 208 |
| 211 | 212 |
| 201 | 202 |

[If **NONE**, go to Item 6]

5. What was the **gross value** of the equine **sold** during **1998**? Dollars

| | |
|-----|-----|
| 203 | 204 |
|-----|-----|

6. Do you (the operator) consider this operation primarily:

- ☐ 1 - a farm or ranch?
☐ 2 - a boarding, training or riding facility (Including recreational places)?
☐ 3 - a breeding service place?
☐ 4 - a place to keep horses, ponies, or other equine for personal use?
☐ 5 - other (Specify: _____)?

Enter Code

213

OVER PLEASE

APPENDIX 3: EQUINE SURVEY QUESTIONNAIRE

7. How many **total acres** were in this operation on **January 1, 1999**? Total acres

900

Include the farmstead, all cropland, woodland, wasteland, and government program land that is owned, rented from others, or managed.
land rented to others.

Exclude

8. What was **gross value of agricultural sales** during **1998**? (include equine sales)
Less than 1000 dollars = 1, 1000 dollars or more = 2 Enter Code

214

Reporting the operator's social security number is voluntary. The authority to request it is Title 7 Section 2204 of the U.S. Code. It will be used only within the National Agricultural Statistics Service for identification purposes.

Operator's
SSN

470

Federal Employer
ID Number

466

(The survey results will be available on the Internet at <http://www.usda.gov/nass/>)

THIS CONCLUDES THE SURVEY. THANK YOU FOR YOUR HELP.

Respondents Name: _____ **Phone:** _____ **Date:** _____

| Respondent | | Response Code | | Sup./Enum. | Eval. | Julian Date |
|------------|-----|---------------|-----|------------|-------|-------------|
| 1-Op/Ptr | 101 | 2-Tel | 910 | 098 | 100 | 987 |
| 2-Sp | | 3-Int | | | | |
| 3-Acct/Bkr | | 7-TR | | | | |
| 4-Oth | | 8-IR | | | | |
| 5-Est R | | 9-Inac | | | | |
| 6-Est NR | | | | | | |



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